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ABSTRACT

This study investigated two functions that instructional objectives might fulfill in the learning situation: (1) organization and (2) orientation. One hypothesis was that instructional objectives can provide organization to learning materials. In this respect, objectives would provide little help when accompanying highly structured learning materials where the organization of the subject is already evident but would facilitate learning when accompanying less structured materials. The second hypothesis was that instructional objectives provide direction for the learning effort, focusing the learner's attention on the important aspects of the learning task and detracting his attention from incidental parts. The orienting function was tested by withholding in the learning situation some of the objectives related to a given set of materials and then, later on, comparing relevant learning and incidental learning on a recall test. The organizing function was tested by presenting a full set of objectives to one group and withholding these objectives from another group; one half of the learners in each group received highly structured materials while the other half received unstructured materials. The organizing function would be supported only if the results of the recall test indicated that the objectives had facilitated learning in the case of the unstructured materials group. Results provided empirical support for the orienting function. No support was provided for the organizing function. (MM)

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Functions of Instructional Objectives: Organization and Direction

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Abstract

Objectives were hypothesized to provide organizational support to learning and to focus learning on relevant aspects of the material. These functions were expected to be strongest with Ss having received a valid prior experience with objectives (objectives and test-items referenced to them) and weakest with Ss having received a non-valid experience (objectives and test-items not referenced to them). The organizing function hypothesis was not supported, nor its interaction with prior experience. The orienting function hypothesis, on the other hand, was supported, as well as its interaction with prior experience.

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INTRODUCTION

The formulation of instructional objectives in specific terms is generally accepted today as a basic component of instructional design. Objectives are seen as providing direction for curriculum development and teaching, as guiding instructional evaluation, and as facilitating learning when provided to students.

The research pertinent to this latter role, the facilitation of learning, has indicated that objectives can indeed be effective in this respect even though a fair proportion of the studies involved have failed to confirm the facilitative hypothesis (Duchastel and Merrill, 1973). In an effort to circumscribe those situations in which objectives do have an effect on learning, research has attempted to disclose interactions between objectives and other variables, such as type of learning or student characteristics, although this approach has met only limited success.

A second approach, based on process hypotheses rather than interaction hypotheses, is aimed at the investigation of various functions which objectives could possibly fulfil in the learning situation. A number of such hypothesized functions have been presented in the above-mentioned review and two of these, the organizing and orienting functions, are investigated in the current study.

The hypothesized organizing function states that objectives can provide some organization to the learning materials, much the same as is done by the use of advance organizers (Ausubel, 1968). Objectives would serve as an external source of structural support, intellectual scaffolding as Ausubel calls it, which would facilitate the learner's task of cognitively integrating the diverse bits of information consituting the learning materials. In this respect, objectives would provide little help when accompanying already highly structured learning materials, where the

organization of the subject is evident; however, they should prove more facilitative of learning when accompanying less structured learning materials. This organizing function of objectives was investigated before in a study of Tobias and Duchastel (1974), but the hypothesis was not confirmed.

The orienting function, in turn, is seen as providing direction to the learning effort. Basically, objectives (or more generally, orienting stimuli) should focus the learner's attention on the important aspects of the learning task, i.e. whatever is defined as important, and detract his attention from the incidental or non-relevant parts of the learning materials. Such a focusing effect, by which relevant learning is enhanced, has been observed in three studies investigating this function, although divergent results have been reported with respect to incidental learning; indeed, this latter type of learning has been either increased by objectives (Rothkopf and Kaplan, 1972), not affected (Morse and Tillman, 1972) or depressed (Duchastel and Brown, 1974).

One possible mediating factor which could have accounted for both the divergent results in the research on the orienting function of objectives and for the lack of effect in the Tobias and Duchastel research on the organizing function (1974) may have been the use which the learners made of the instructional objectives which were provided to them. Such a possibility was advanced in discussing the results obtained in the studies by Duchastel and Brown (1974) and Tobias and Duchastel (1974). Other researchers have also strongly hinted at such a possibility (Tieman, 1968; Morse and Tillman, 1972).

The basic idea implied here is quite simply that objectives cannot be expected to facilitate learning unless the learner uses them for that purpose. Merely providing objectives to the learner does not necessarily mean that he will pay much attention to them and that he will actively use them to

facilitate his learning. In the Tobias and Duchastel study (1974) for example, some subjects were observed to briefly read the list of objectives once, then put them aside for the remainder of the learning task. It is little wonder then that the data failed to support the hypothesis investigated in that study.

The degree to which the learner uses the objectives provided to him can be controlled by manipulating the learner's immediate past experience with objectives in an experimental situation. For example, in one situation the learner can be provided with learning materials as well as with a set of appropriate objectives and later tested with items directly referenced to these objectives. In another situation, the learner can also be provided with objectives but tested with items not referenced to the objectives. If these procedures are repeated over a number of trials, one would expect that the learners in each of the two situations would gradually adopt quite different processing strategies. Indeed, the learners which have been provided with the "valid experience" will most likely use their objectives to facilitate their learning in further trials. On the other hand, their counterparts provided with the "non-valid experience" with objectives will probably simply disregard the objectives they are provided with in further learning tasks.

The purpose of the present study was to examine the hypothesized orienting and organizing functions of objectives in light of this latter factor which is thought to play a role in situations in which students are provided with objectives.

In effect, the study actually comprises two studies in one, since there is no relation between the organizing and orienting functions of objectives; they are merely examined here in the same study in order to capitalize on the procedures aimed at manipulating the learners' experience with objectives, a factor hypothesized to affect both functions.

It is opportune here, before describing the rather involved procedure in some detail, to briefly depict the experimental paradigms which will put these two hypothesized functions to a test. In the first instance, the orienting function is tested by withholding in the learning situation some of the objectives related to a given set of learning materials (a prose passage) and then, later on, comparing relevant learning (corresponding to the objectives presented) and incidental learning (corresponding to the objectives withheld) on a recall test covering the entire material. If the orienting function is operative, relevant learning should be increased and incidental learning depressed when compared to a situation in which no objectives are presented at all.

The organizing function is tested in turn by presenting the full set of objectives related to a (different) passage to one group of learners and withholding these objectives from another group, while at the same time manipulating the structure of the passage received by each of the two groups. One half of the learners in each group receive a highly structured text to learn, while the other half receive an unstructured text, which nevertheless presents the same information to the learner. The organizing function would be supported if the results of a recall test indicated that the objectives had facilitated learning only in the case of the unstructured text and not in the case of the highly structured text. This would be evidenced statistically by an Objectives x Structure interaction in the data.

PROCEDURE

Overview

The study can be viewed as consisting of three phases, although the learners themselves were unaware of this distinction.

In Phase 1, the learners were given one of three treatments aimed at differentially affecting their experience with objectives. These treatments consisted in different combinations of learning passages, objectives and test-items.

In Phase 2 of the study, the learners received one of four treatments consisting in a learning passage in which availability of objectives and passage structure were the manipulated variables. The learners were expected at this point in the study to possess one of three prior experiences with objectives, as developed in Phase 1.

Finally, Phase 3 of the study consisted in the administration of different post-tests which were used to assess the learning resulting from the various treatments.

Phase 1

The manipulated variable in this phase of the study was the congruence between the objectives and the test-items which accompanied a series of three learning passages which the learners had to learn. For each passage, six objectives were developed, as well as a number of test-items associated with each one of the objectives. The learners participating in the study were divided into three groups. In the first one of these, labelled the Valid Experience group, the learners received one half of the objectives along with each one of the passages, presented in turn, and were tested with relevant test-items, i.e. the items directly referenced to their objectives. In a second group, the Non-Valid Experience group, the learners received the same objectives with the learning passages but were tested with incidental items, i.e. the items which were not referenced to any of the objectives they received. Finally, in a third group, the No Experience group, the learners received the three learning passages without any objectives and were tested with a mixed set of items from the total number of items developed.

The learning materials which were utilized in Phase 1 consisted of three short passages which were written by the authors. The passages dealt with various characteristics of imaginary planets, nations or tribes. The imaginary nature of these elements ensured that the learners would not enter the experimental situation with any previous knowledge of the material to be learned.

The passages were constructed through the use of concept name by concept attribute matrices, employing a procedure originally applied in this context by Frase (1969). Sentences were constructed by simply combining a concept name (e.g. Melbon) with a concept attribute (e.g. [is] 90 million miles from Earth). The three passages were developed from 6 x 6 matrices and therefore resulted in passages of 36 sentences each.

While the matrices from which the passages were developed are called concept name by concept attribute matrices, it should be noted that the type of learning involved (Gagne, 1970) is not concept learning, but rather a type of associational learning in which a given attribute is paired with a given name.

Six objectives were developed for each of the three passages and three objectives in each set were randomly selected for inclusion in the treatments received by the Valid and Non-Valid Experience groups. The instructional objectives used in this study were written in a behavioral form (Mager, 1962) and thus contain an action verb as well as the conditions and criteria of performance. The specific wording utilized is illustrated in the following example:

> On a multiple-choice test, you will be expected to recognize with 100% accuracy:
>
> 1) THE DISTANCE OF EACH PLANET FROM EARTH.
>
> 2) THE TYPE OF TERRAIN EACH PLANET IS COVERED WITH.
>
> 3) THE COLOR OF EACH PLANET'S SUNSETS.

The objectives, when presented to the learners, immediately preceded the passage to which they referred, at the top of the page containing the passage.

The three tests which were developed for each of the learning passages each consisted of 18 items, presented in a multiple-choice format involving five alternatives. The reliability indices of internal consistency for these tests range from .75 to .87.

Phase 2

The fourth learning passage dealt with various items and characteristics associated with them. It was constructed from a 6 x 5 concept name by concept attribute matrice and was thus composed of 30 sentences. While this fourth passage is shorter than the first three, it is actually more complex than these latter. This added complexity results from a second difference between the passages: in the first three, each concept name was repeated six times as it was associated with six different attributes; in the fourth passage, on the other hand, each concept name was presented only once, i.e. a new name was associated with each new attribute.

The main reason for employing materials in this study which were highly artificial was that the structure of the passages could be adequately controlled. Two structures were developed for the fourth passage: a name organization and a random organization of the learning materials.

The name organization involved a paragraph grouping in such a way that all sentences relating to a name category, e.g. furniture, were presented consecutively. The following excerpt illustrates this organization: "The table is blue. The dresser costs $3. The chair is large. The sofa is one year old. The desk...". Within each paragraph, the order of presentation of the attributes was varied so that serial position cues would not be present.

The random organization involved no grouping; the sequence of sentence presentation has determined randomly. The paragraph format, however, was retained, with six sentences forming one paragraph as in the name organization. The following excerpt illustrates the random organization: "The wrench is six months old. The garage is red. The movie costs $6. The sweater...".

Six objectives, similar to those available for the first three passages, were developed for the fourth passage. The specific wording is illustrated in the following partial list of objectives:

> On a multiple-choice test, you will be expected to recognize with 100% accuracy:
>
> 1) THE CHARACTERISTIC ASSOCIATED WITH EACH PIECE OF FURNITURE.
>
> 2) THE CHARACTERISTIC ASSOCIATED WITH EACH TYPE OF BUILDING.
>
> 3) THE CHARACTERISTIC...

Four treatments were formed by combining the following variables and their respective values: a) objectives (either all six of them available with the learning passage or none of them available); and b) passage structure (name organization or random organization). These four treatments were randomly assigned to four subgroups from each one of the previous three groups of learners, thus making a total of 12 groups disposed in a 3 x 2 x 2 design.

Phase 3

In this phase of the study, the learners were administered various tests to assess their learning from the third and fourth passages.

Two tests were devised to assess the effects of the organizing function of objectives: a) a recognition test; and b) a free-recall test. Both instruments measured the amount of learning resulting from the study of the fourth passage. The recognition test contained 30 multiple-choice items, formatted with five alternatives each. The reliability index of internal consistency calculated for this test was .86. The free-recall test directed students to write down as many sentences as they could remember from the fourth passage.

A single free recall test was devised to assess the effects of the orienting function of objectives by measuring the amount of recall derived from the third passage. While relating to the third passage, this test was administered only after the occurrence of the fourth passage and its associated post-tests in order not to influence the variables at play in the fourth passage. Four scores were obtained from this test: (i) a total correct recall score; (ii) a total uncorrected recall score; (iii) a relevant recall score; and (iv) an incidental recall score. The first score is the number of sentences correctly recalled by the learners. The last three scores, on the other hand, are not measures of learning per se, but rather indices of the extent to which the learning effort was focused on certain aspects of the material. The indices represent the number of sentences written down by each learner in each category, irrespective of whether the sentences were in fact correct or incorrect. The relevant recall index is the number of sentences recalled which related to the objectives presented. The incidental recall index is the number of sentences not related to the objectives presented. The total uncorrected recall index was formed by adding up these first two indices.

Subjects and Materials

This study was conducted in the United States where a total of 251 secondary school pupils from a High School in the State of Florida participated in the study as part of a class assignment. The grade levels of these pupils corresponds to a British counterpart ranging from the second form to the fifth form.

The different treatments and instruments developed for this study were incorporated into instructional/tests booklets 22 pages long. The booklets included (i) a cover page with instructions; (ii) the first three passages, each one of which was followed by its corresponding test; (iii) the fourth passage; (iv) the recognition test for the fourth passage; (v) the free-

recall test for the fourth passage; and finally (vi) the recall test for the third passage.

The instructional/test booklets were randomly distributed to the learners. Five minutes were allowed for the study of each one of the passages.

RESULTS

The organizing function of objectives

The means and standard deviations of the recognition and free recall data from Passage 4 are presented in Table 1. The results from the analyses of variance performed on these data are presented jointly in Table 2.

Insert Tables 1 and 2 about here

As expected, main effects were not significant; however, nor was the Objectives x Structure interaction hypothesis significant. Interaction hypotheses which were significant were the Objectives x Prior Experience interaction on the free recall data and the Structure x Prior Experience interaction on the recognition data. And finally, the Objectives x Structure x Prior Experience interaction hypothesis was not significant for either set of data, although close to significance ($p < .10$) for the free recall data.

The orienting function of objectives

The means and standard deviations of the free recall data from Passage 3 are presented in Table 3. A one-way analysis of variance was conducted over each subset of this data, the results of which are presented in Table 4.

Insert Tables 3 and 4 about here

These results reveal that no appreciable difference exists between the three groups with respect to the total number of sentences recalled, whether corrected

or uncorrected. From an examination of the means involved, it can be seen that the differences are indeed negligable. However, the results also reveal that strong differences exist between the groups on both the number of relevant sentences recalled and the number of incidental sentences recalled.

Simple effect contrasts between the three groups revealed that the Valid Experience group recalled significantly more relevant sentences (Tukey $q = 4.1$; $df = 229$; $p < .05$) and significantly less incidental sentences (Tukey $q = 5.5$; $df = 229$; $p < .01$) than the Non-Valid Experience group. The Valid Experience group also recalled significantly less incidental sentences than the No Experience group (Tukey $q = 4.4$; $df = 229$; $p < .01$).

DISCUSSION

The organizing function hypothesis

A principal hypothesis of this study predicted an Objectives x Structure x Prior Experience interaction. This interaction however was not supported at the chosen significance level for either the recognition or the free recall data. However, the interaction present in the free recall data was significant at the .10 probability level. It may be convenient to assess this interaction at the same time as the Objectives x Prior Experience interaction effect, which was significant ($p < .05$) on the free recall data.

From this interaction between Objectives and Prior Experience, it would seem that objectives facilitated learning for the Valid and No Experience groups but not for the Non-Valid Experience group. In fact, objectives depressed learning for this latter group. However, when examining the means in Table 1, it becomes evident that objectives have increased performance in the Valid Experience group only for those learners receiving the randomly structured text, and not for those exposed to the name structured text. This finding is consistent with the hypothesis that objectives should be most helpful in learning situations where they can aid learning by providing structure to the materials. However, the fact that the Name organization did not in itself

aid learning is surprising in view of the fact that previous research has often demonstrated the superiority of an organized passage over an unorganized one (Frase, 1973). In the interaction being discussed here, the group with the lowest score was a Name group. Furthermore, the superiority of objectives for the No Experience group in the Objectives x Prior Experience interaction results directly from the depressed level of learning of this Name group.

Turning now to the Structure x Prior Experience interaction which was significant at the chosen level for the recognition data, it was found that the Name structure led to superior performance only for the learners in the Valid and Non-Valid Experience groups, i.e. for those learners whose prior experience included objectives. The No Experience group, on the other hand, performed better with the randomly structured text.

Such results as these are not readily interpretable along the lines of any consistent conceptual model. Additional research would be needed in order to satisfactorily explain the phenomena presented by these interactions.

The orienting effect and prior experience

The free recall data from Passage 3 provide support for the view that objectives fulfil an orienting role in learning. It was observed that the total number of sentences recalled, whether corrected or uncorrected, differed very little from group to group. However, once the sentences recalled were partitioned into relevant and incidental sentences, clear differences emerged. The Valid Experience group showed increased relevant responding over the Non-Valid Experience group and much decreased incidental responding. Furthermore, the Valid Experience group was also inferior to the No Experience group with respect to incidental responding. It would seem likely therefore that the objectives presented to the Valid Experience group focused the learners' attention on the relevant sentences in the passage to the detriment of the incidental sentences. This situation seems to be reversed in the case of the Non-Valid Experience group. Indeed in this

latter group, it is possible that the test-items actually took over the orienting function and focused attention on what was defined as incidental material. These results are conceptually equivalent to an Objectives x Prior Experience interaction.

The results replicate the findings reported in the previous study by Duchastel and Brown (1974) in which both increased relevant and depressed incidental learning were observed. They also partly conflict with the Morse and Tillman (1972) and the Rothkopf and Kaplan (1972)findings. In both these studies, relevant learning was increased but incidental learning was either not affected or also increased. Could it not have been, however, that the three studies preceding the present one each dealt with learner populations having a different prior experience with objectives? This would seem to be a possible explanation, among others perhaps, for the divergence in findings among the three studies. The data obtained in the current study tend to support such a view.

CONCLUSION

In summary then, the present study provided further empirical support for the orienting function of objectives and also pointed out that the prior experience of students with objectives must be taken into account in conducting and interpreting research in this area. No support was provided for the hypothesized organizing function of objectives. However, those interactions which were present in the data further reveal the importance of prior experience in examining hypothesized functions of objectives. These interactions are however not clearly interpretable. Certainly, further research should be awaited on this topic before any general conclusions are advanced.

It should be emphasized that the results obtained in this study are directly generalizable to the knowledge category of learning only, and that it would be desirable to replicate them with other types of learning. In order to

increase the generality of the findings, it would also be desirable to replicate the study with different learner populations, e.g. with elementary school pupils, as well as with different materials.

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TABLE 1

MEANS AND STANDARD DEVIATIONS OF THE RECOGNITION AND FREE RECALL DATA FROM PASSAGE 4

TREATMENT	N	RECOGNITION MEAN	RECOGNITION SD	FREE RECALL MEAN	FREE RECALL SD
Objectives/Name Structure/Valid Experience	18	20.7	4.9	9.3	5.2
Objectives/Random Structure/Valid Experience	20	20.1	6.6	12.9	5.7
No Objectives/Name Structure/Valid Experience	21	21.1	5.4	8.8	4.3
No Objectives/Random Structure/Valid Experience	18	18.6	4.8	8.4	5.2
Objectives/Name Structure/No Experience	22	20.5	6.2	10.1	5.5
Objectives/Random Structure/No Experience	21	20.8	6.6	10.6	5.4
No Objectives/Name Structure/No Experience	21	16.9	5.2	6.4	4.4
No Objectives/Random Structure/No Experience	21	20.9	5.4	10.1	5.7
Objectives/Name Structure/Non-Valid Experience	18	19.4	6.5	9.8	6.5
Objectives/Random Structure/Non-Valid Experience	21	17.9	4.7	8.4	3.6
No Objectives/Name Structure/Non-Valid Experience	19	22.9	4.8	11.5	5.6
No Objectives/Random Structure/Non-Valid Experience	21	19.5	7.1	10.2	6.4

TABLE 2

SUMMARY OF THE ANALYSES OF VARIANCE RESULTS FOR THE RECOGNITION AND FREE RECALL DATA FROM PASSAGE 4

Source	df	Recognition		Free Recall	
		F	p	F	p
Objectives (O)	1,229	<1	--	1.9	--
Structure (S)	1,229	<1	--	1.2	--
Prior Experience (PE)	2,229	<1	--	<1	--
O x S	1,229	<1	--	<1	--
O x PE	2,229	3.0	<.10	3.8	<.05
S x PE	2,229	3.7	<.05	2.4	<.10
O x S x PE	2,229	1.6	--	2.4	<.10

TABLE 3

MEANS AND STANDARD DEVIATIONS OF THE
FREE RECALL DATA FROM PASSAGE 3

	Valid Experience		No Experience		Non-Valid Experience	
	Mean	SD	Mean	SD	Mean	SD
Total Correct Recall	6.2	5.6	6.1	5.8	6.2	5.9
Total Uncorrected Recall	8.2	6.0	8.4	5.8	8.0	6.4
Relevant Sentences	7.6	5.6	4.5	3.3	3.3	4.3
Incidental Sentences	0.6	1.4	3.9	3.1	4.7	4.4

TABLE 4

SUMMARY OF THE ANALYSES OF VARIANCE RESULTS
FOR THE FREE RECALL DATA FROM PASSAGE 3.

Source	df	F	p
Prior Experience Effect on Total Correct Recall	2,229	<1	--
Prior Experience Effect on Total Uncorrected Recall	2,229	<1	--
Prior Experience Effect on Relevant Recall	2,229	19.3	<.01
Prior Experience Effect on Incidental Recall	2,229	37.8	<.01